CLAIMS

What is claimed is:

1. An apparatus for generating AC power to a load, comprising:
a variable speed energy generating device producing differing amounts of power at different speeds;
a power conditioning system coupled to said variable speed energy generating device, wherein said power conditioning system calculates a speed command based on said AC power that controls said variable speed energy generating device;
a regulator section coupled to said power conditioning system; and
a converter coupled to said regulator section and producing said AC power, wherein said converter couples said AC power to said load.

2. The apparatus according to claim 1, wherein said converter is selected from the group consisting of: transformerless AC pulse width modulator inverter, DC-AC inverter, static inverter, rotary converter, cycloconverter, and AC-AC motor generator set.

3. The apparatus according to claim 1, wherein the variable speed energy generating device is selected from the group consisting of: internal combustion engine, turbine, micro-turbine and Stirling engine.

4. The apparatus according to claim 1, wherein said regulator section is an enhanced conduction angle dual boost DC bus voltage regulator.

5. The apparatus according to claim 1, further comprising a field winding coupled to said variable speed energy generating device.

6. The apparatus according to claim 1, further comprising a speed sensor coupled to said variable speed energy generating device.

7. The apparatus according to claim 1, wherein said speed command is derived from engine speed versus load lookup tables.

8. The apparatus according to claim 1, wherein said speed command is calculated from exhaust content sensors.

9. The apparatus according to claim 1, further comprising a bypass switch coupling said variable speed energy generating device to said load.

10. The apparatus according to claim 1, further comprising an adaptive speed loop gain algorithm for detecting steady state speed errors.

11. A method for producing quality AC output power to a load, comprising:
measuring a set of properties for an actual load output;
measuring a speed of a variable speed energy generating device;
calculating a speed command signal using said speed and said properties;
converting said speed command signal into a throttle adjustment signal; and
adjusting said speed of said variable speed energy generating device using said throttle adjustment signal, thereby adjusting said AC output to said load.

12. The method according to claim 11, further comprising:
calculating a load shed term; and
reducing a portion of said load based on said load shed term.

13. The method according to claim 11, further comprising:
measuring a throttle position; and
calculating said speed command signal using said speed, said properties, and said throttle position.

14. The method according to claim 11, further comprising:
regulating a generator voltage by adjusting a field voltage of a generator of said variable speed energy generating device.

15. The method according to claim 11, further comprising:
increasing said speed and observing an increase speed error;
decreasing said speed and observing a decrease speed error; and
calculating a steady state speed error.

16. A variable speed generator system, comprising:
a variable speed engine with a throttle control;
a generator coupled to said variable speed engine and generating an AC output;
a voltage regulator section coupled to said AC output and producing a voltage regulated output;
an inverter coupled to said voltage regulated output, wherein said inverter output is coupled to a load; and
a power conditioning system having a speed versus load controller, wherein said speed versus load controller adjusts said throttle control based upon a speed command that is derived from said AC output and a speed versus load table.

17. The variable speed generator system according to claim 16, wherein said voltage regulator section is an enhanced conduction angle (ECA) dual boost DC bus voltage regulator.

18 The variable speed generator system according to claim 16, wherein said speed versus load controller comprises a field control loop and a speed control loop.

19. The variable speed generator system according to claim 16, wherein said speed versus load controller comprises a field control loop, a speed control loop, and a throttle position feedback loop.

20. The variable speed generator system according to claim 16, further comprising a throttle valve actuator coupled to said engine.

21. The variable speed generator system according to claim 16, further comprising a load shed term processing loop.

22. The variable speed generator system according to claim 16, wherein said load is a grid and said inverter output is a current source coupled said grid.

23. The variable speed generator system according to claim 16, wherein said inverter output is a voltage source coupled said load.

24. The variable speed generator system according to claim 16, wherein said load versus power table is based conditions selected from the group consisting of: maximum fuel efficiency, minimum emissions, and optimum transient load response.

25. The variable speed generator system according to claim 16, further comprising an energy storage module coupled to said voltage regulator section.

26. The variable speed generator system according to claim 16, further comprising an adaptive speed loop gain algorithm for detecting steady state speed errors.